PART 17

HANDING OVER

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PART 17
HANDING OVER

17.1 General

This section applies to procedure(s) on handing over the works and sites related to Tertiary Treatment Plant back to the Employer at the end of 5 years period of operation and maintenance by the Contractor. This shall include all civil structures, mechanical systems including pumping mains system, electrical system including 11kV/0.433kV substations, HT & LT switchgears & MCC's, FCMA's, control &relay panel, capacitor banks, DG set, AMF panel, battery & battery charger, Lighting system, cables, earthing systems etc., the instrumentation/control & automation system, communication system, SCADA systems, all ancillary buildings and complete campus area.

The procedure for Handing Over shall include the final examination/tests of the system by the Engineer. O&M Contract Completion Certificate shall be issued by the Employer after the successful final examination/tests and submission of the completion documents before the contract deadline.

17.2 Duties and Responsibilities

1. All cost for the examination, tests/training and preparation of any documents of the activities shall be the Contractor's responsibility.
2. The Contractor shall provide all necessary labour, materials, electricity, instrument and meters, fuel and water required for tests.
3. Receiving inspection:

   All of equipment and construction material arrived in site shall be inspected by the Engineer to verify whether damaged or not. Rejected items shall be replaced by the Contractor at his own cost.

   The typical examination shall consist of as follows:

   - Appearance test /Visual examination
   - Check attached invoice

4. Conduct training prior to Contract Completion:

   The Contractor shall provide the training program to BWSSB staff member for six months before acceptance inspection and before 5-year operation.

   The typical training program is as follows:

   - Basic engineering
   - Study of Operation and maintenance manual
   - Operation skill /technology (Mechanical, Electrical and Instrumentation, control and automation) including normal and emergency operation
   - Maintenance, repair skill/ technology (Mechanical, Electrical and Instrumentation, control and automation)
   - Record keeping and maintenance of records
   - SCADA systems
   - Safety & Health
   - Evaluation of the program (examination)
   - Others requested by the Engineer

5. Conduct Joint Inspection Prior to Contract Completion:

To verify the plant condition and performance of plants including pumps, blowers, valves, gates, cranes and all other equipment at the end of 5 years of operation and maintenance, Contractor shall conduct all the required Tests prior to Contract Completion. The contractor is responsible to conduct annual inspections of cranes & other lifting equipment and each and other equipment as required by law/Govt. of Karnataka.

The inspection items are given below in Table 17. 1 but not limited to this.

Table 17. 1: Items to be examined at the end of 5 Years O&M Period

Items	Description
1) Appearance test /Visual examination (Damage/crack, differential settlement, soil settlement, peel off painting, missing/lost, leakage of water/solution/gas, corrosion, condition of structures, and others)	- All Civil structures, building including interior/exterior, fence/gate, stairs, others - All Mechanical & Electrical equipment/accessories, others - All Pipe line valves and gates, others - All Instrumentation, Control and Automation equipment, others - Local SCADA system
2) Performance examination (Selection of operation mode, selection of facilities, flow/water level, overflow, vibration/noise level, speed of pump/motor, smoothness, gap/spaces, accuracy, setting value, condition of structures, others)	- Check Sequence, or Manual operation including water level, pressure sensors/protections, others - Check specification of all Mechanical equipment including pressure and water level gauges, pressure relief valves, others - Check specification of all Electrical equipment, others - Check specification of all Pipeline including valves, gates, others - Check specifications of all Instrumentation and Control equipment, others - Check specification of all accrual condition after troubleshooting, others - Performance tests of all pumps, blowers and other equipment - Check specification of all Local SCADA system
3) Verification of rectified works (System, leakage, crack, damage, soil settlement, corrosion, others)	- Check a list of all defect items, history, tendency, repeating, others - Check a list of all miss operation and maintenance items, others - Check all factors of defect / near miss operation, others - Verification of action on the measures taken, and others - Verification of all rectified works with the reports and photo, others - Check emergency works and its factor, action plan,

Items	Description
	others - Check actual condition after rectified works, others
4) Operation skill (Staff member, others)	- Review of summary reports on O&M activities - Check time and activity of staff member, and others - Interview operator regarding troubleshooting, others - Paper test (basic knowledge, calculation of chemical dosing, safety, others) - Field test (using/put on the safety gear, drill of chlorine leakage accident, local SCADA system, others)
5) Waste Water analysis (Sampling and analysis, others)	- Location of sampling and time, and date - Raw sewage and treated sewage - Each unit process - Authorized certificate from approved agency (or Bureau of Indian Standards Certified Laboratory)
6) O & M Record	- Check inventory list (parts, chemical, reagent, others) - Check the quantity of inventory, others - Check maintenance tools and equipment, vehicle, others
7) Spare parts and others	- Check inventory list (parts, chemical, reagent, others) - Check the quantity of inventory, others - Check maintenance tools and equipment, vehicle, others

6. Submission of the report on completion of O&M Contract:

The Contractor shall submit the completion report after passing the final tests.

The report shall consist of relevant documents, for request for issue the Completion certificate of 5 years O&M period, which is given below in Table 17. 2 but not limited to this.

Table 17. 2: Documents to be handed over at the End of 5 Years O&M Period

Contents	Description
1) Outline	- Summary of project, scope of work, location of project, main component with specification, others
2) Completion Photographs (At acceptance complete inspection, completion inspection and final inspection)	Photographs with short description - Civil (structural, buildings, others) - Mechanical, Electrical and I&CA (equipment, facility, others) - Piping works, all type of valves, others - Local SCADA system, others

Contents	Description
3) Inspection summary (At acceptance complete inspection, completion inspection and final inspection)	Appearance test /Visual/ Performance examination - Table of Summary of test activity based on daily and monthly - List of type of test, date, inspector, evaluation, comments - Civil (name of structure, drawing no., drawings, design dimension, previous dimension, actual dimension, photograph with short description others) - Mechanical (name of facility and equipment, tag no., quantity, others) - Electrical (name of facility and equipment, tag no., quantity, others) - Instrumentation, Control and Automation (name of facility and equipment, tag no., quantity, others) - Local SCADA system (name of facility and equipment, tag no., quantity, others)
4) Main inspection data (At construction)	Summary of data with graphic /chart - Civil (plate load bearing test, compressive strength test, water retaining test, compaction field test, road construction works in TTP, hydrostatic test, others) - Mechanical test, others - Electrical (IR test, earthing resistance test, others) - Instrumentation, Control and Automation - Local SCADA system
5) Inspection record (At acceptance complete inspection, completion inspection and final inspection)	Appearance test /Visual/ Performance examination/ Verification of rectified works - Civil (Refer to Table 17.1, point no.1,2,3) - Mechanical (Refer to Table17.1, point no.1,2,3) - Electrical (Refer to Table 17.1, point no.1,2,3) - Instrumentation, Control and Automation (Refer to Table 17.1, point no.1,2,3) - Local SCADA system
6) Training and commissioning record (At first and second training program)	- Summary (Schedule of training and commissioning, attendance rate, impression on training program) - Training attendance list (participants, trainings date, others) - Commissioning daily record (Sewage flow rate of designed and actual, name of operated facility, list of measurement and its time and reading value, raw sewage and treated sewage quality, value of V/A/kW of each equipment, Local SCADA system, others) - Photographs with short description
7) Sewage quality certification data (At acceptance complete	- Location of sampling and time, and date - Raw sewage and treated sewage - All Process Units

Contents	Description
inspection, completion inspection and final inspection)	- Issued from Authorized entity
8) Operation and Maintenance manual (Civil, Mechanical, Electrical and Instrumentation, Control and Automation)	- Updated O&M Manual
9) O & M records	- Water quality analysis and consumption of electricity and chemicals - Screening, grit and sludge handling amount - List of O&M record, Ledger and operation record - Various types of Ledgers and other plant organization charts and plant management record including cost and expenditure - History of trouble shooting - O&M record of a process, unit operation and equipment - Mechanical (name of parts, tag no., quantity, location of stock, others) - Electrical (name of parts, tag no., quantity, location of stock, others) - Pipes & fittings (name of parts, tag no., quantity, location of stock, others) - Valve & Gates (name of parts, tag no., quantity, location of stock, others) - Instrumentation, Control and Automation (name of parts, tag no., quantity, location of stock, others) - Others (name of parts, tag no., quantity, location of stock, others)
10) Spare parts list	- Mechanical (name of parts, tag no., quantity, location of stock, others) - Electrical (name of parts, tag no., quantity, location of stock, others) - Pipes & fittings (name of parts, tag no., quantity, location of stock, others) - Valve & Gates (name of parts, tag no., quantity, location of stock, others) - Instrumentation, Control and Automation (name of parts, tag no., quantity, location of stock, others) - Safety equipment and devices including for staff and for testing - Others (name of parts, tag no., quantity, location of stock, others)
11) Key list with boxes	- Name of key, location, tag no., quantity, Civil (all related

Contents	Description
	material: reinforcement bar, cement, aggregate, sand, gravel, asphalt, crashed stone, chemical admixture, water reducing agent, pozzolana, water-tightness sheet, construction equipment, manhole, water-resistant coating, paint, windows, door, others) - Mechanical (all related equipment. screens, pumps, blowers, dewatering Centrifuge, Chlorine scrubbers, Chlorinators, scarper, conveyor, hopper, central drive & rotating mechanisms, pipes, valves, gates, pressure gauges, safety valves, safety equipment, flow meters, coating, painting, others) - Electrical (all related equipment: electrical wire, electrical conduit, motor, control panel, relay, transformer, heater, generator and silencer, timer, breaker, light/lamp, switch, street light, earthing, measurement equipment, air condition, communication equipment, electric pole, coating painting, ventilation fan, air duct, others) - Instrumentation, Control and Automation (all related equipment, others) - Safety equipment - Others
12) Manufacture produced catalogue (Civil, Mechanical, Electrical and Instrumentation, Control and Automation)	See above (11)
13) Instruction manual (Civil, Mechanical, Electrical and Instrumentation, Control and Automation)	See above (11)
14) Factory inspection record or Quality assurance (Civil, Mechanical, Electrical and Instrumentation, Control and Automation)	See above (11)
15) Photograph (During Construction, at defect liability, at joint completion inspection) (Civil, Mechanical, Electrical, Instrumentation, Control and Automation)	History of Construction, Replacement of defect liability - Civil: Construction site before starting construction, earthwork, arrangement of bar, cleaning before placing, formwork, concrete mixing work, placing, vibrating, curing, remove of formwork, backfill, compaction, all field inspection and lab test, others - Mechanical: Inspection at factory, receiving inspection, completion inspection, all field inspection and lab. test, others

Contents	Description
	- Electrical: inspection at factory, receiving inspection, completion inspection, all field inspection and lab. test, others - Instrumentation and Control: inspection at factory, receiving inspection, completion inspection, all field inspection and lab. test, others
16) Production samples (Civil, Mechanical, and Instrumentation, Control and Automation)	All samples for technical approval - Attach Analytical instruments name, approved sign of the Engineer.
17) Report	- Monthly and Annual report - Others
Note: *These data shall be provided both in soft and hard copies, in proper professional format.*	

17.3 Specifications

The specification of materials used for repairs shall be the same as have been used in the original work. Specifications for any materials which were not used during construction shall be approved by the Engineer prior to Handing Over.

17.4 Check List for TTP

17.4.1 General

Within the framework of the Contractor's responsibilities given above, the Contractor shall carry out the following activities. However, these shall not limit the requirement for other activities which otherwise are required as per terms and conditions of the Contract or to fulfill the Contractor's responsibilities or are essential as per good industrial practices. The Contractor shall hand over all the components of works in good working condition for the following, but not limited to:

a) All pumps, motors and other mechanical equipment etc., at the Tertiary treatment plant (all works constructed in this Contract).

b) All required consumables required for functioning of plant with inventory of material.

c) All Electrical Equipment's such as Transformers, 11kV Metal Enclosed Switchboards & Switchgears, 415 V metal enclosed switchgears (PCC) /MCC, 415 V Power capacitor and control panel, Diesel Standby Generator with AMF Control Panel and Synchronizing panel, Battery, battery charger and DC Distribution Board, Variable Frequency Drives, Non Segregated Bus Duct, Power & control cables, Cable carrier system, Lighting system, Earthing and lightning protection systems of the Plant (All works constructed in this Contract).

d) All Instrumentation, Control and Automation equipment etc., (All works constructed in this Contract).

e) Administrative buildings etc. (All works constructed in this Contract) in neat and clean condition.

f) AMC contracts with system / equipment suppliers, as necessary for PLC and SCADA system supplier or the authorized system integrate or as executed work for this project.

g) Lighting fixtures and the lighting system of all areas and replacement of all non-functional lighting fixtures.

h) Records for the followings but not limited to:
   - Water quality report

- Repair history of all mechanical, electrical and Instrumentation, Control and Automation equipment in Tertiary treatment plant and communication instruments.
- Logbooks through PLC/SCADA system.
- Daily log of operations of all the important equipment with time tag.
- Hourly readings of water levels, pressure sensors, flow rates and integrated quantity of water.
- Operational cost.
- Monthly Running hours of the all Mechanical equipment and total electrical power consumption. (Power consumption by each Pump and each Pump House each blower and blower house)
- Generator running hour and its production of electricity
- Sludge, screenings and grit handling amount
- Daily list of alarms with time tag.
- Logbook format and the data to be included in the logbook.
- Last periodic maintenance done for all equipment/buildings of the system.

i) Required spares, general and special tools & tackles, test equipment and adequate inventory of required accessories or equipment itself for repair/replacement of defective electrical, mechanical, Instrumentation, Control and Automation, pipe, and the communication system. However, at the end of the Contract, the Contractor shall hand over the full spares, tools and tackles as supplied with the Contract by replacing the used items with fresh supplies of the same specifications.

j) Repair of the roads, buildings and campus area utilities.

k) Potable water supply facilities at treatment plant all its units.

l) Record of stores for the electrical, mechanical and Instrumentation, Control and Automation equipment as well as that for consumables. The records will include but shall not be limited to:
   - Materials received and issued for works.
   - Proper arrangement of material in stores to ensure its safety and easy availability.
   - Maintaining store areas in a neat and tidy condition.
   - Keeping records and accounting for the incoming materials,
   - Keeping records and accounting for the consumed materials.

m) Structures/buildings of campus areas of Tertiary Treatment Plant and others built in the Contract must ensure adequate cleanliness, ventilation, illumination and structural safety. In addition to this, the general hygienic standards must be in acceptable condition and adequate plantation horticultural activities must be well maintained to give pleasant environment of the campus / building.

n) Updated operation and maintenance manual as defined in specifications for O&M works.

o) 6 sets of Hard Copies and 2 sets of Soft copies of all "As Commissioned Final Drawings".

17.4.2 Lubrication

The Contractor, in the operation and maintenance manuals, shall furnish a complete schedule of recommended oils, grease, and other required lubricants.

The Contractor shall indicate the brand name of indigenously available equivalent lubricants, with their complete duty specifications, in the O&M manual. The Contractor shall also furnish the schedule of quantities for each fill, frequency of filling and annual requirement in O&M manual.

Where lubrication is affected by means of grease, preference shall be given to a pressure system which does not require frequent adjustment or recharging. Frequent, for this purpose, means more

than once in a month. Where more than one type of special grease is required, a grease gun for each special type shall be provided for the usage.

17.4.3 Spare Parts

All spare parts used for the equipment in the maintenance of the system must be from the manufacturer of the equipment or, if the equipment itself has been made with parts from other manufacturers, the parts must be of the same make as used in the equipment supplied and installed.

All spare parts shall be packed for long storage under the climatic conditions prevailing at the Site. Each spare part shall be labeled on the outside of its packing with its description, number and purpose and, if more than one spare is packed in a single case, a general description of the case contents shall be shown on the outside and a packing list enclosed.

17.4.4 Electrical System

The Contractor shall hand over the following at the end of Operation and Maintenance Period:

- Revised as built drawings based on all modifications during O&M Period. All Electrical Drawings like Single Line Diagrams, Control Circuits Equipment Layout, Cable Layout, and Cable Schedules, Lighting Layouts, Earthing Layouts etc., should be maintained and handed over.
- Details of Protective Relay Settings and time relay settings including any changes done during the Operation and Maintenance period, Details of Oil Changes / Filtration of Transformers, Records of any changes made in the System during the Operation and Maintenance period etc should be maintained.
- Equipment wise maintenance record during O&M Period, as per daily checking out / inspection and regular (every 6 months or 12 months).
- Motor wise Power consumption Details and over all power consumption detail of plant.
- Details of IR Test of all Equipment's like, HT / LT Switchgear Panels, Diesel Generators, Transformers and Cables etc. should be maintained.
- Log book showing details Electrical faults that have occurred in the plant and record of corrective actions taken during O&M period.
- Equipment wise technical data given by equipment supplier, Documents showing Bill of Materials and Operation & Maintenance Manual (hard copy or soft copy).
- List of mandatory spares that are to be maintained at stores and their actual availability in plant, if it is below same has to be replenished.
- Details of Measurement of Earth resistance, Earth pit wise and overall values during the O&M Period.
- Details of Illumination Levels during the O&M Period along with details of changes, if any effected during the O&M period.

17.4.5 Electrical Checks to be done during handover after O&M Period

- Contractor to provide a test schedule & format to be approved by engineer before commencing any test.
- Checking of all electrical equipment, items etc. as per bill of materials. Visual checking and tracing out the circuit based on revised as built drawings.
- Physical Operational checks of all equipment & protections have to be done.
- Power frequency voltage tests & IR measurement for various electrical equipment, items & cables to be done.
- Testing of transformer oil samples.

- Measurement of earth resistance for individual earthing system & overall for the installation.
- Checking of Lightning Protection System.
- Measurement of illumination level at various premises.
- If any item is found to be faulty during the above checks/tests the same shall be rectified/replaced as necessary.

17.4.6 Instrumentation, Control and Automation System

The Contractor shall hand over the following documents/manuals/programs at the end of Operation and Maintenance Period for TTP under this contract:

- Detailed drawings and O&M manuals of all the Instruments, Panels, Valve Actuators, Field Instruments etc. supplied under the contract.
- Detailed drawing and manual of the PLC installed. Manual shall include the PLC series installed along with complete details on I/O modules, Ethernet switch, Relay modules, and converters (if any).
- A complete manual shall be provided which shall include operating instructions and troubleshooting techniques of the PLC and accessories installed illustrated with examples. This shall be provided along with the standard manufacturer's literature.
- A complete manual shall be provided which shall include operating instructions and troubleshooting techniques of the SCADA and accessories installed, illustrated with examples. This shall be provided along with the standard manufacturer's literature.
- A complete manual shall be provided which shall include operating instructions and troubleshooting techniques of the interface control panel to Shimsha Bhavan, illustrated with examples. This shall be provided along with the standard manufacturer's literature.
- Interoperability testing tool/software shall be provided along with relevant manuals and operating instruction with examples.
- Latest PLC program back-up, SCADA software back-up with license, SCADA database backup, reports and alarm back-up, Historical archived data containing reports and alarms and configuration set-up shall be provided.
- All software's used under ICA shall be handed over along with their original licenses.
- Complete list of database /addresses shall be provided clearly indicating the spare tags for PLC, SCADA software.
- List of mandatory spares that are to be maintained at stores for complete ICA package and their actual availability in plant, has to be provided.
- Any password's set to access the internal PLC program. interface control panel shall be provided and demonstrated.
- All passwords (PLC, Interface control panel & SCADA and other software/hardware) shall be provided in a sealed envelope.
- PLC, SCADA package shall be updated with the latest software version/ patch before handing over. The same has to be demonstrated to the engineer.
- Latest licensed version of windows operating system along with MS–Office or equivalent software which is prevailing at that point of time shall be installed on SCADA machines and other machines installed and integrated with the SCADA package. The same shall be demonstrated to the engineer.
- Contractor shall conduct an adequate training session for the client's staff which shall include PLC configuration, troubleshooting techniques, SCADA configuration and troubleshooting

techniques, diagnostic techniques and troubleshooting techniques for wireless technology employed for communication.

- The training session shall be of duration of minimum Five (5) working days at a stretch.
- Manufacturer's literature/Manuals for flow meters, level transmitters, switches, pressure transmitters etc. and analytical instruments installed.
- Instrument wise, PLC and SCADA wise maintenance records of complete O&M period shall be provided.
- A complete and updated list of all manufacturers/system integrators/contractors of ICA with contact numbers shall be provided. The same shall also be made available on site for ready reference.
- The final as commissioned versions of all drawings of ICA, which will include cable termination details, I/O mapping, database details etc. shall be provided in PDF format and editable format and loaded in the operator machine available on site. The same shall be demonstrated to the engineer.

17.4.7 ICA Checks to be done during handover after O&M Period for TTP under this contract

- Contractor to provide a test schedule and format to be approved by the engineer before commencing any of the tests.
- Functional Checking of all Laboratory instruments, real time multi parameter influent and effluent monitoring systems, Auto samplers, and ICA equipment including PLC based SCADA system, flow meters, pressure and level instruments, vibration monitoring instruments, and wireless equipment being used for communication.
- Loop checks shall be conducted.
- All instrument cabling shall be inspected for continuity. If found faulty, the same shall be replaced and demonstrated.
- All instrumentation cable conduits shall be checked for damage. If found faulty, they should be rectified or replaced and sealed to the satisfaction of the engineer.
- Visual operational checks of all the Panels including PLC panel, SCADA system, and interface control panel, and Surge Control Panel.
- Licensing feature of PLC, SCADA software and hardware shall be demonstrated.
- Functional check of set points change at HMI/SCADA and its downloading to PLC's concerned.
- Hot-standby feature of PLC and hot swappable feature of I/O modules shall be demonstrated. If found to be faulty/non-operational, shall be rectified and if required replaced to normal working condition and demonstrated to the client.
- Dual-redundant server feature of SCADA shall be demonstrated. If found to be faulty/non-operational, shall be rectified and if required replaced to normal working condition and demonstrated to the client.
- Functional check of data received/transmitted from remote stations shall be conducted in conjunction with SCADA.
- Functional check of interface control panel with Master SCADA center at MIS-2 Shimsha Bhavan shall be conducted.
- Historical archiving of all data shall be demonstrated.
- Availability of memory for smooth operation of PLC, SCADA machines shall be demonstrated. If found to be in-adequate, the same shall be rectified /archived and demonstrated.

- If any instruments and automation equipment are found to be faulty during the above tests, the same shall be rectified or replaced as necessary.

17.4.8 Tertiary Treatment Plant Ancillary Works

- Make gardens and plantation in the campus area green, neat and tidy with removal of shrubs, weeds, grass and unwanted vegetation and make pruning, trimming and cutting from the Plant Area along with.
- Reinstate the roads and lighting fixtures and lighting circuits to and within the sites to original state.
- Make good and in working condition for lighting fixtures and lighting circuits, water supply facilities in Treatment plant, offices and other buildings.
- The Contractor shall carry out ordinary repairs to buildings, and other civil and ancillary works. The repairs may include but shall not be limited to the following items:
    - Easing of doors and windows, monsoon repairs to roofs, attention to drains, rain water spouts, attention to plinth protection.
    - External white or color wash, external and internal painting shall be carried out to all buildings irrespective of the condition and after any repairs including plastering, internal distempering,
    - All signs including those for access, warning signs (for example for hazardous, deep area, etc.) shall be in a condition equivalent to that at issue of the Commissioning Certificate.
    - The approach/access to and internal roads within the sites shall be in a condition equivalent to that at issue of the Commissioning Certificate. This shall include but not be limited to road surface (condition, camber, etc.), sub-surface, drainage, lighting (including power supply), and signage and road markings, pedestrian and animal access. Any safety and access issues which have been identified during the Operation Service period shall be addressed.
- Any faults in the electric installation, leakages, earthing, exposed wire ends and any hazards on this account to the users/inmates of the buildings, should be taken care of suitably, wiring, which is damaged or outlived, should be replaced.
- Damaged sanitary lines should be replaced and choked lines cleared.
- Proper drainage of the area around the building should be ensured to avoid stagnation of rain water/ house effluent, in order to prevent malarial conditions. Where courtyards exist in the buildings, their drainage into the outer drains should be ensured. Any choked drains should be cleared properly.
- Leaking roofs should be attended to immediately with suitable repairs/ treatment, as the case may be. The rain waterspouts should also be cleared of blockages, etc. The roof should be swept clean of leaves, debris, etc., if any.
- The plaster on outer walls of the building, which is exposed to weather, should be repaired before rains in order to prevent dampness inside. Where plinth protection has been provided, it should be checked and the damaged portions, if any, should be repaired before rains.
- Damaged / corroded / unsafe flooring should be repaired / replaced in order to (i) facilitate safe access, (ii) allow Plant to be removed to the flooring where required, (iii) prevent dampness inside the rooms, etc. during rains, etc. The same applies to hand railing.
- Repairs of damaged floors, door / window fittings, water taps, water coolers, furniture, desert coolers, electric circuits, must be taken up on complaints using the material of same quality as used during construction.

- Pump House, blower room ventilation system to be checked for effective heat dissipation from the Pump Motors and Electrical Equipment's.

17.4.9 Wireless Communication System

- Make good a wireless communication system to ensure reliable and easy communication to and from TTP under this contract. Make good a wireless communication system to ensure reliable and easy communication to and from TTP and Master SCADA control center at Shimsha Bhavan.
- Replacement of batteries, faulty sets and all other non-functional equipment to ensure trouble free communication if required.

17.5 Completion Documents for TTP

Completion (Handing over) documents shall include on a minimum five (5) sets of softcopies and five (5) sets of hard copies. The hard copies shall be provided with hard bind clearly indicating the version/revision submitted. All the contents shall be indexed. The contents of completion documents shall be clearly legible and shall include original manufacturer's literature on a minimum and incorporate any changes as per site conditions.

The comprehensive updated operation and maintenance manuals six (6) sets shall be submitted at the end of the operation and maintenance period. It shall be updated based on the principals broadly listed in Part-16.

17.6 As-Built Drawings for TTP

Revised As-built drawings based on all modifications during O&M Period shall be submitted at the end of O&M period. It shall include all drawings of treatment units (plan and all necessary sections), utility and ancillary buildings, site layout of treatment plant and pumping stations, drawing of pump house, layout of pumps and all other mechanical equipment and piping, all electrical drawings like Single Line Diagrams, Schematic Diagrams, Control Circuits Equipment Layout, Cable Layout & Cable Schedules, Earthing Layouts and all ICA Drawings like P&ID, System configuration diagram (PLC & SCADA architecture), Instrument installation drawings, Instrument cable schedule, and cable layouts. Six (6) sets of the revised as-built drawings shall be submitted in hardcopies and softcopies (editable form).

17.7 Prices for Handover

The Contractor, at the time of bidding, will be responsible to ensure the completeness and adequacy of his Bid Price to fulfill the entire responsibilities as described above. His bid price, as quoted on a yearly basis in the Schedule of Prices, shall include all costs for handing over.

17.8 Completion certificate for O&M Contract

- The Contractor on completion of O&M period will request the Employer for a joint inspection of the Plant, after ensuring that all the Plant equipment's are in good handing over condition and all the requirements / documents as specified in this contract are also ready for handing over.
- Based on above request a Joint Inspection with Engineer shall be arranged by the Contractor to assess the condition of civil structure, mechanical, electrical and instrumentation, control and automation equipment and First Joint Inspection Report, for various required remedial actions, repair actions, replacement actions, tests etc. shall be prepared.
- The Contractor shall attend to all points of Joint Inspection Report, by carrying out all such remedial / repair / replacement actions, tests at his own cost, and after attending, will confirm the same to the Employer.

- On receipt of the confirmation as above, Second Joint Inspection shall be arranged by the Contractor, for certification of completeness of remedial work, as well as condition of all civil works to its original appearance.
- The Contractor shall submit the entire required documents to Employer for review and comments. The Contractor shall resubmit the documents incorporating the comments.
- The Employer shall issue the Completion Certificate of the O&M Contract to the Contractor within 30 days of acceptance of Second Joint Inspection Report, subject to the above documents and obligation are met by the Contractor before 90 days prior to handing over of the plant.

End of Part 17